

Response of a White Spruce and White Pine Planting to Sulphur and Fertilizer Tablets

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Ten years after planting on the shallow soils of Eastern Ontario, white spruce and white pine showed little or no benefit from artificial acidification (sulphur) of the site at time of planting or from fertilizer tablets.

The 650,000 hectares of shallow and low-fertility soils of Eastern Ontario (Smith's Falls plain (3); Farmington soil series (1)) have proved difficult to re-forest after use for many years as marginal crop and pasture land. In 1969, a test was established on this extensive soil type to study the effect of using artificial acidification with sulphur and forest fertilizer tablets to improve survival and growth.

Methods

An area in the research section of Limerick Forest (44°50' N, 75°45' W approximately) was plowed and disked in fall 1969 to prepare for the test. The area was former pasture, moderate sod, on a Farmington sandy loam about 30 to 100 centimeters deep, over limestone bedrock. It is in a moist to wet area; the pH was about 8.1 (range 7.8 to 8.4). In spring 1970 prior to planting, the entire area was disked. Then adjacent plots were planted to white spruce (*Picea glauca* (Moench) Voss)

and white pine (*Pinus strobus* L.). There were 2,400 of each species in plots of the four treatments (six replications X four treatments X 100 trees/plot):

1. Control—these plots were planted without further treatment.
2. Sulphur—flour of sulphur (agricultural) was applied at the rate of 2,520 kilograms per hectare on the ground surface and disked to about a 15-centimeter depth. This treatment reduced pH about 2.3 units in other tests (2).
3. Fertilizer—one 9-gram planting tablet (Agriform Forest Starter Tablet¹ 22-8-2) was placed at about a 15-centimeter depth, 2.5 centimeters from the roots of each seedling at planting time.
4. Sulphur and fertilizer-combination of treatments 2 and 3 at the same levels.

The planting was done on May 15, 1970, using 3+0 white spruce (averaging 23.5 cm in height, 0.44 cm in diameter, 5.52 g in oven-dry weight, and 4.09:1 top/root ratio) and 3+0 white pine (21.6 cm, 0.52 cm, 7.74 g, and 5.17:1, respectively)

¹ Agriform Forest Starter Tablets were obtained through the courtesy of Brighton By-Products Inc., P.O. Box 23, New Brighton, PA 15066.

grown at Kemptville Nursery (about 15 km away) using a local seed source. The planting was by the wedge method in cultivated soil, and there was no further cultivation, mowing, or spraying for weed control after planting.

The surviving trees in the plots were counted and measured at the end of the second (height, terminal growth), the fifth (height), and the tenth (height, fall 1979) growing seasons and the data have been examined by the analysis of variance.

Results and Discussion

No significant differences due to the treatment were found in the survival or height data of either species after the 2d and 5th year. In the 10th year, however, treatment differences were significant in height growth, but not in survival. This has been summarized by species in table 1, with the addition of aggregate height calculations (planting rate 3,000 trees/ha X survival percentage/100 X average height).

White Spruce. The height data in table 1 show that the sulphur treatments increased the growth of white spruce. This is perhaps due to acidification of the soil, resulting in a reduction of the pH from over 8.0 to less than 6.0 (2). Sutton (4) suggested optimum growth of this

species to be in the pH range 5.0 to 7.0.

White Pine. The information in table 1 indicates that neither sulphur nor fertilizer tablets separately had a significant effect on survival or growth. However, in combination, height growth was significantly improved, being about 33 percent better than that on control plots. The aggregate height (3,000 trees/ha planting rate x survival/100 x average height) of the sulphur x fertilizer combination is less than 6 percent better than the control, which is due to the poorer survival rate of the combination treatment. As examined, neither sulphur, fertilizer tablets, nor their combination is a worthwhile treatment to aid in planting white pine on this site.

Literature Cited

1. Hills, G. A., N. R. Richards, and F. F. Morwick. 1944. Soil survey of Carleton County. Rep. No. 7, Ontario Soil Survey, 103 p.
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3. Putnam, D.F. 1946. Natural regions of eastern Ontario. In Conservation in Eastern Ontario. Ont. Dep. Plan. and Dev. 79-96.
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Table 1.—Effects of sulphur and fertilizer tablets on both year survival, height, and aggregate height of white spruce and white pine

Treatments	Survival	Height	Aggregate height
	%	cm	m/ha
White spruce			
Control	56.7 ¹	86.9a	1,478
Sulphur	57.5	124.5b	2,148
Fertilizer tablet	47.2	94.8a	1,342
Sulphur and fertilizer tablet	50.7	128.7b	1,958
Significance	NS ²	*	
White Pine			
Control	53.5	173.8a	2,789
Sulphur	39.3	191.6a	2,259
Fertilizer tablet	50.3	157.7a	2,380
Sulphur and fertilizer tablet	42.2	232.2b	2,940
Significance	NS	**	

¹Entries in vertical columns not followed by the same letter are significantly different at the 5.0 percent level or better.

²NS = not significant.

* = significant at 5.0 percent.

** = significant at 0.1 percent.